

TESTING THE WATERS



Sources of Beachwater Pollution

Most beach closings and advisories are issued because beachwater monitoring has detected bacteria that indicate the presence of pathogens—microscopic organisms from human and animal wastes that pose a threat to human health. The key known contributors of these contaminants are stormwater runoff, untreated or partially treated discharges from sewage treatment systems, discharges from sanitary sewers and septic systems, and wildlife.

STORMWATER RUNOFF


Stormwater runoff starts as rain or snowmelt. As it washes over roads, rooftops, parking lots, construction sites, and lawns, it becomes contaminated with oil and grease, pesticides, litter, and pollutants from vehicles. On its way to storm drains, it also can pick up fecal matter from dogs, cats, pigeons, other urban animals, and even humans. Human waste may also find its way into storm drain systems from adjacent sewage pipes that leak, or from businesses or residences that have illegally connected their sewage discharge to the storm drains. Illicit discharges also occur when people empty holding tanks from recreational vehicles and trailers into storm drains.

The amount of pollution present in urban runoff tends to correlate with the amount of impervious cover. Impervious cover is anything that stops water from soaking into the ground, such as roads, sidewalks, parking lots, and buildings. A study conducted in North Carolina found that a watershed that was 22% covered by impervious surfaces had an average fecal coliform count more than seven times higher than a watershed that was 7% covered by impervious surfaces.¹ However, even in less densely populated areas, uncontrolled runoff can foul beaches.

As the population along the U.S. coast grows, more land is converted to impervious surfaces that shed rather than absorb falling rain. Today, stormwater runoff from urban and



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suburban areas is posing a significant problem that is growing rapidly with rising populations and sprawling development. More than half of the people in the United States live in coastal counties, occupying only 17% of the nation's land mass (excluding Alaska). Between 1980 and 2003, the coastal population grew by 33 million, and it is projected to increase by another 12 million by 2015.² At the current rate, by 2025 more than a quarter of all of our coastal acreage will be developed.³

HUMAN SEWAGE FROM TREATMENT SYSTEMS

Sewage overflows from aging sanitary and combined sewer systems, leaking sewage pipes, and malfunctioning sewage treatment plants and pump stations have always been a major cause of pollution at ocean, bay, and Great Lakes beaches. As demonstrated at Rancho Santa Margarita, California, in March 2010, a single ruptured sewer line can quickly spill hundreds of thousands of gallons of untreated sewage into coastal waters and result in contaminated beachwater along miles of beaches.⁴

Combined Sewer Overflows

Combined sewer systems, concentrated in the Great Lakes region and northeastern United States, carry both raw sewage from residences and industrial sites and stormwater runoff from streets to sewage treatment plants. Although treating stormwater before releasing it to surface waters is desirable, during periods of rainfall or snowmelt, the volume of the combined wastewater can become too great for the treatment plant to handle. In such circumstances, the excess

flow is diverted to outfall points that discharge pollutants—including raw sewage; floatables such as trash, syringes, and tampon applicators; toxic industrial waste; and contaminated stormwater—into the nearest stream or coastal waterway. This is known as a combined sewer overflow, or CSO.

CSOs are a major cause of pathogen contamination in marine and Great Lakes waters near urban areas. As of 2002, CSOs discharged 850 billion gallons of raw sewage and stormwater annually, and 43,000 CSO events occurred per year nationwide. Although they are most prevalent in urban areas, CSOs affect 46 million people in 746 communities throughout 32 Northeast and Great Lakes states.⁵

CSOs contaminate shellfish waters as well as recreational beaches. Shellfish harvesting has been restricted in the majority of the 659 shellfish beds located close to a CSO outfall.⁶ Although an EPA policy that aims to reduce these overflows has been in effect since 1994, virtually all combined sewer systems continue to overflow when it rains. A significant number of communities with CSOs still have not submitted plans for controlling them.

Sanitary Sewer Overflows and Discharges From Sewer-Line Breaks

Sanitary sewer systems carry human and industrial waste from buildings to sewage treatment plants where it is treated. These sewer systems can discharge untreated sewage when the treatment plants are overwhelmed or malfunction or when sewer lines break, posing a threat to bathing beach safety. Separate sanitary sewers serve approximately 164 million people nationwide.⁷

Although most of these systems were built more recently than the combined sewer systems, they are aging and deteriorating rapidly. A nationwide survey of 42 treatment plants found some system components that have been in use for as long as 117 years; the average is 33 years.⁸ As population and sewer load increases and rehabilitation and maintenance schedules lag, pipes can deteriorate and break, spilling sewage directly onto streets or into waterways.

The EPA has estimated that 23,000 to 75,000 sanitary sewer overflows (SSOs) occur annually, discharging a total of 3 billion to 10 billion gallons per year. Nearly 70% of sewage overflows from human waste sewage lines are due to obstructions such as tree roots or grease clogs, line breaks, and mechanical failures.⁹

Wet weather places demands on sanitary sewer systems even though these systems do not treat stormwater runoff. This is because even when there are no improper connections between stormwater and sanitary sewers, water seeps through manholes and into the sewer lines and also falls onto the surface of the treatment units during rain events. This can lead to the discharge of raw sewage from manholes, overflowing pipes, and treatment-plant bypasses. Although only 26% of sanitary sewer overflows nationwide were caused by wet weather events and related inflow and infiltration, these events accounted for nearly 75% of the total SSO volume discharged.¹⁰

In January 2001, the EPA proposed SSO regulations that would have required improved capacity, operation, and maintenance as well as public notification when overflows occur. The Bush administration shelved this initiative, but the Obama administration's EPA announced in June 2010 that it is considering a suite of actions to address SSOs.

Inadequately Treated Sewage

Sewage plants near coastal waters tend to serve densely populated, rapidly growing urban areas. When too many homes and businesses are hooked up to a sewage treatment plant, the plant is prone to more frequent bypasses and inadequate treatment. Moreover, sewage treatment plants can, and often do, malfunction as the result of human error, breakage of old equipment, or unusual conditions in the raw sewage. When that happens, raw or partially treated sewage may be discharged into coastal waterways and their tributaries.

Some sewage systems also bypass all or a portion of their treatment plants when flows exceed capacity during rain events. This practice can also put pathogens in waterways and should be prevented.

HUMAN SEWAGE FROM SEPTIC SYSTEMS AND BOATING WASTE

Septic Systems

About one-third of new construction and 23% of existing U.S. dwellings use some kind of septic tank or on-site waste disposal system. If not sited, built, and maintained properly, septic systems near the coast can leach wastewater into coastal recreational waters, contaminating bathing beaches with fecal matter. Malfunctioning septic systems at just a few

near-shore properties can result in beachwater contamination that is significant enough to trigger a beach closure. Runoff can also carry bacteria from failing inland septic systems into streams that empty into recreational waters. Unfortunately, homeowners often do not adequately maintain their septic systems. Studies reviewed by the EPA cited failure rates of 10% to 20%.¹¹ Despite this, there is no federal regulatory program to control waste from septic systems, and local governments and states rarely inspect these systems sufficiently to prevent septic system failures.

Boating Waste

Marinas are generally located in areas that are naturally sheltered or where a breakwater has been constructed. This shelter results in reduced circulation of clean water around the docks, which allows boating waste to accumulate and pose a serious health threat. Waste may also be discharged improperly from boats that are in use, posing a health and aesthetic threat to bathing beaches.

Federal law requires boats with onboard toilets either to treat the waste with chemicals before discharging it or to hold the waste and later pump it out into a sewage treatment plant. Also, the federal Clean Vessel Act (CVA) of 1992 provides federal grant money to states for building pump-out and dump stations in marinas so boaters can dispose of human wastes in an environmentally sound manner. However, there is limited oversight of the adequacy of pump-out facilities in many areas.¹²

AGRICULTURAL DISCHARGES AND AGRICULTURAL RUNOFF

Agricultural pollution impacts nearly 40% of the country's polluted rivers and streams.¹³ The production of farm animals has increasingly shifted toward huge, industrial-scale operations where large numbers of animals are confined together. These confined animal feeding operations (CAFOs) often produce vast quantities of manure that far exceed the assimilation capacity of neighboring crops and pastures. Runoff from farms and animal feeding operations may contain high concentrations of pathogenic animal waste.

CLIMATE CHANGE AND ITS EFFECT ON DRY/WET WEATHER CONDITIONS

Beachwater quality is generally adversely affected by increased rainfall. Scientists agree that in many regions of the United States, climate change will increase the frequency and magnitude of rain and large storms; will cause more runoff, coastal flooding, and coastal erosion; and will bring warmer water and air temperatures. These changes will exacerbate existing causes of beachwater pollution that threaten public health. In fact, the Intergovernmental Panel on Climate Change found that “[w]aterborne diseases and degraded water quality are very likely to increase with more heavy precipitation.”¹⁴

In particular, global climate change is predicted to increase the amount of rainfall in regions where combined sewer systems are concentrated. In the Great Lakes region, climate modeling predicts that the regional average annual CSO frequency between 2060 and 2099 will increase between 13% and 70%.¹⁵

Even in areas that have separate sewer systems, like much of the West, an increase in extreme rainfall events can still lead to more pollution in coastal waters via increased stormwater runoff. For instance, in California, warmer temperatures can mean more winter precipitation that falls as rain and less that falls as snow, leading to more winter runoff. More winter runoff over saturated soils will result in larger sediment flows and more bacteria in beachwaters.

BEACHGOERS

In the 2005 study “Outbreaks Associated With Recreational Water in the United States,” researchers found that bathers themselves are an important localized source of contamination leading to illness outbreaks.¹⁶ All swimmers release fecal organisms when they enter the water in a process called bather shedding. Fecal accidents are also a health risk, as are diaper-aged children if care isn’t taken to ensure that their wastes are kept from entering the water. The presence of *E. coli* and coliform bacteria has been shown to correlate with the number of visitors and periods of high recreational use (generally the summer and weekends).¹⁷

WILDLIFE AND PET WASTE

Municipalities sometimes list waterfowl as the cause of beach closings or advisories. During migration season, large or excessive populations of waterfowl can gather at beaches or in suburban areas that drain into recreational waters.

Pet waste deposited on or near the beach also carries pathogens that can wind up in beachwater when pet owners do not pick up and properly dispose it. The fecal matter from these animals can overload the normal capacity of a beach to absorb wastes, degrading water quality, particularly if there is no vegetation around the waterway to absorb the waste.

¹ Mallin, Michael A., “Wading in Waste,” *Scientific American*, June 2006, pp. 53–59.

² NOAA-National Ocean Service, “Population Trends Along the Coastal United States: 1980–2008,” September 2004, pp. 1 & 6, http://oceanservice.noaa.gov/programs/mb/pdfs/coastal_pop_trends_complete.pdf.

³ Beach, Dana, “Coastal Sprawl—The Effects of Urban Design on Aquatic Ecosystems in the United States,” Pew Ocean Commission, 2002.

⁴ Barboza, Tony, “Major sewage spill could keep O.C. beaches closed through the weekend,” *Los Angeles Times*, March 26, 2010.

⁵ EPA, Report to Congress: Impacts and Control of CSOs and SSOs, pp. 4-13 to 4-19.

⁶ EPA, Report to Congress: Impacts and Control of CSOs and SSOs, p. 5-14.

⁷ EPA, Report to Congress: Impacts and Control of CSOs and SSOs, p. 4-22.

⁸ EPA, Report to Congress: Impacts and Control of CSOs and SSOs, p. 2-1.

⁹ EPA, Report to Congress: Impacts and Control of CSOs and SSOs, pp. 4-25 to 4-27.

¹⁰ EPA, Report to Congress: Impacts and Control of CSOs and SSOs, p. 4-27.

¹¹ EPA, Onsite Wastewater Treatment Systems Manual, February 2002, EPA/625/R-00/008, at pp. 1-4 and 1-6, <http://www.epa.gov/nrmrl/pubs/625r00008/625r00008.pdf>.

¹² U.S. General Accounting Office, “Water Quality: Program Enhancements Would Better Ensure Adequacy of Boat Pumpout Facilities in No-Discharge Zones,” GAO-04-613, May 2004.

¹³ EPA, National Water Quality Inventory: Report to Congress, 2004 Reporting Cycle, EPA 841-R-08-001, January 2009, p. 12.

¹⁴ IPCC, Fourth Assessment Report, Working Group II Report, “Impacts, Adaptation and Vulnerability,” Ch. 14, <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter14.pdf>.

¹⁵ EPA, “A Screening Assessment of the Potential Impacts of Climate Change on Combined Sewer Overflow (CSO) Mitigation in the Great Lakes and New England Regions,” EPA/600/R-07/033F, February 2008, p. 19.

¹⁶ Craun, Gunther F., Calderon, Rebecca L., and Craun, Michael F., “Outbreaks Associated With Recreational Water in the United States,” *International Journal of Environmental Health Research*, August 2005, Vol. 15, No. 4, pp. 243–262.

¹⁷ McDonald, A.T., Chapman, P.J., and Fukasawa, K. “The Microbial Status of Natural Waters in a Protected Wilderness Area,” *Journal of Environmental Management*, Vol. 87, No. 4, June 2008, pp. 600–608.